ZOLL M SERIES SERVICE MANUAL

Critical Care Transport (CCT)

9653-0456-01 Rev. B

The issue date or revision level for this operation guide is shown on the front cover.
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Preface

ZOLL Medical Corporation's *M Series Service Manual* is intended for the service technician who identifies malfunctions and makes repairs at the subassembly level. Place this insert into the three-ring binder containing the *M Series Service Manual* and all other M Series option inserts.

This document provides information required for maintenance of the M Series Critical Care Transport (CCT) unit, and contains the following sections:

Principles of Operation on page 1 — provides a general overview of CCT functionality.

Maintenance Procedures on page 3 — describes procedures for verifying CCT display operation and integrity.

Disassembly Procedures on page 5 — describes procedures for removing the CCT front panel display from the M Series unit.

Replacement Parts on page 8 — lists the field-replaceable parts for the CCT option and provides information on ordering replacement parts from ZOLL.

Conventions

This *M Series Service Manual* insert uses the following conventions:

Warning! **Warning statements describe conditions or actions that can result in personal injury or death.**

CAUTION Caution statements describe conditions or actions that can result in damage to the unit.

Note: Notes contain additional information on using or maintaining the M Series unit.

Additional M Series documentation

For more information on M Series CCT operation, see the following documents:

- *M Series CCT* insert (part number 9650-0222-01) of the *M Series Operator's Guide* — describes user tasks for display-related options on the M Series CCT unit.
- *M Series Operator's Guide* (part number 9650-0200-01) — describes all the user tasks for general operation of the M Series unit.
- *M Series Configuration Guide* (part number 9650-0201-01) — describes the M Series features and functions whose operation can be customized by authorized users.

Safety Considerations

Service technicians should review these safety considerations prior to servicing any equipment and read the manual carefully before attempting to disassemble the unit. Only qualified personnel should service the M Series unit.

Federal (U.S.A.) law restricts this unit for use by or on the order of a physician.

Non-ZOLL manufactured accessories

Safety and effectiveness data submitted by ZOLL Medical Corporation to the Food and Drug Administration (FDA) under section 510(K) of the Medical Device Act to obtain approval to market is based on the use of ZOLL accessories such as disposable electrodes, patient cables and batteries. The use of external pacing/defibrillation electrodes and adapter units from sources other than ZOLL is not recommended.

ZOLL makes no representations or warranties regarding the performance or effectiveness of its products when used in conjunction with pacing/defibrillation electrodes and adapter units from other sources. If unit failure is attributable to pacing/defibrillation electrodes or adapter units not manufactured by ZOLL, this may void ZOLL's warranty.

Warnings

All persons near the equipment must be warned to "STAND CLEAR" prior to discharging the defibrillator.

Warning!

SHOCK HAZARD!

The M Series CCT unit can generate up to 2400 volts with sufficient current to cause lethal shocks.

Do not discharge the unit's energy internally more than three times in one minute or damage to the unit may result.

Do not discharge a battery pack except in a Base PowerCharger^{4x4}, a compatible ZOLL Battery Charging/Testing unit, or an M Series unit.

Do not use the M Series unit in the presence of flammable agents (such as gasoline), oxygen-rich atmospheres, or flammable anesthetics. Using the unit near the site of a gasoline spill may cause an explosion.

Do not use the M Series unit near or within puddles of water.

Radio Frequency Interference (RFI)

The M Series unit is protected against interference from radio frequency emissions typical of two-way radios and cellular phones (digital and analog) used in emergency service/public safety activities.

Users of the M Series unit should assess the unit's performance in their typical environment of use for the possibility of radio frequency interference from high-power sources. Radio Frequency Interference (RFI) may be observed as shifts in monitor baseline, trace compression, or transient spikes on the display.

Technical Service

For terms and conditions associated with your warranty, consult your purchasing agreement (for customers in North America) or a ZOLL authorized representative (for customers outside North America).

To maintain this warranty, the instructions and procedures contained in this manual must be strictly followed. For more information, please contact ZOLL Medical Corporation's Technical Service Department at 1-800-348-9011 (North America). If calling from outside North America, contact ZOLL Medical Corporation headquarters at 1-978-421-9655.

Contacting Technical Service

If the M Series CCT unit requires service, contact the ZOLL Technical Service Department:

Telephone: 1-800-348-9011
1-978-421-9655

FAX: 1-978-421-0010

When requesting service for the M Series unit, please provide the following information to the Technical Service representative:

- unit serial number
- description of the problem
- department using the equipment
- sample chart recorder strips documenting the problem, if applicable
- purchase order to allow tracking of loan equipment
- purchase order for a unit with an expired warranty

Returning a unit for service

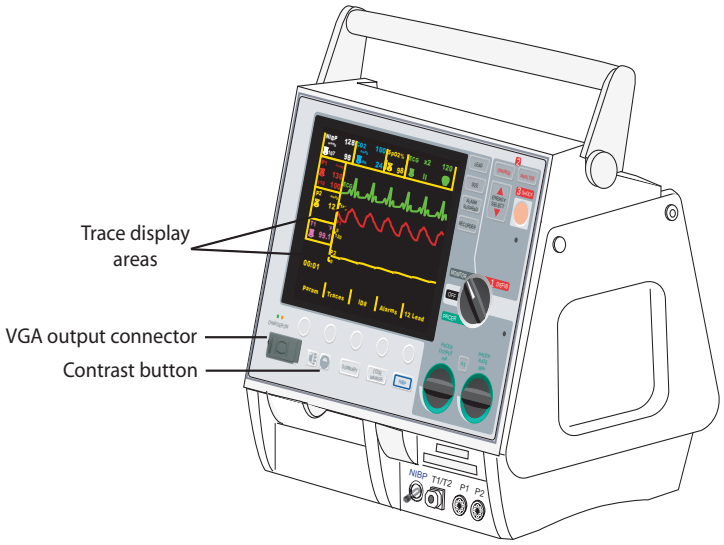
If you need to send the unit to ZOLL Medical Corporation for repair, you must obtain a service request (SR) number from the Technical Service representative. Units are available on loan while your unit is being repaired.

For customers ...	Return the unit in its original container to ...
in the U.S.A.	ZOLL Medical Corporation 269 Mill Road Chelmsford, MA 01824-4105 Attention: Technical Service Department (SR number)
in Canada	ZOLL Medical Canada Unit #15 5266 General Road Mississauga, Ontario L4W 1Z7 Attention: Technical Service Department (SR number)
outside North America	the nearest authorized ZOLL Medical Corporation Service Center. To locate an authorized service center, contact the International Sales Department at ZOLL Medical at the above-noted address.

Principles of Operation

The Critical Care Transport (CCT) option on the M Series provides expanded display capabilities for ECG monitoring and extends M Series vital signs monitoring options to include two invasive pressure channels and two temperature channels. In addition, the M Series CCT unit provides color display of monitored parameters and includes a VGA output port for connection to an external VGA display.

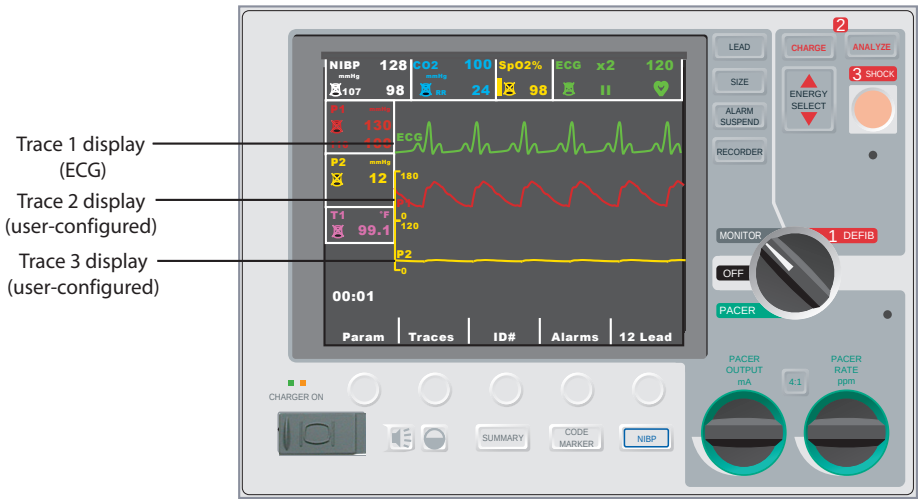
Figure 1-1: M Series with CCT option



Multiple trace display

The M Series CCT unit can display three separate waveform traces simultaneously in MONITOR mode. Trace 1 is reserved for ECG monitoring, and Traces 2 and 3 are user-configurable. In PACER or DEFIB mode, advisory messages appear in the Trace 3 display area under certain conditions.

Figure 1-2: M Series CCT front panel



See the *M Series CCT* insert of the *M Series Operator's Guide* for information on setting the trace display parameters.

Full color display

The M Series CCT unit provides color display functionality for monitored parameters. You can assign specific colors to different parameters displayed on the M Series CCT monitor screen.

By default, parameter colors are assigned as follows:

Parameter	Color
ECG	Green
SpO2	Yellow
EtCO2	Blue
NIBP	White
Temperature	Purple
Pressure Channel 1 (P1)	Red
Pressure Channel 2 (P2)	Cyan
Arterial Pressure (ART)	Red
Pulmonary Arterial Pressure (PA)	Yellow
Central Venous Pressure (CVP)	Cyan
Intracranial Pressure (ICP)	White

See the *M Series Configuration Guide* for information on configuring color display settings.

VGA monitor output

The M Series CCT unit provides a VGA output connector so that you can display parameters on an external monitor equipped with an industry-standard 15-pin VGA connector.

To conserve battery power, the VGA output port is not active at power-up. See the *M Series CCT* insert to the *M Series Operator's Guide* for information on connecting the M Series CCT unit to an external display monitor.

Maintenance Procedures

It is important that users conduct the Operator's Shift Checklist procedure at the beginning of every shift to maintain the M Series unit ready for immediate use. This checkout procedure can be completed in a few minutes and requires no additional test equipment. See the *M Series Operator's Guide* for the Operator's Shift Checklist.

In addition, a qualified biomedical technician should perform the following maintenance procedure with the target VGA monitor every six (6) months to ensure that the M Series CCT function is operating properly:

- "VGA Output Test" on page 4

Recording your results

Photocopy the checklist at the back of the *M Series Service Manual* and use the copy to record the results of the maintenance tests. As you complete each step in a procedure, mark the appropriate Pass/Fail/NA box, and keep the checklist for your maintenance file. Complete all the steps of the procedure before evaluating the test results.

22.0 VGA Output Test

The VGA Output test verifies that the VGA port on the front of the M Series CCT unit is operating properly and that information from the M Series CCT unit is displayed correctly on the connected monitor.

Required equipment

You need the following equipment to complete the VGA output test:

- M Series CCT unit (with fully-charged battery installed)
- display monitor with VGA connector

Procedure

Follow these steps to perform the VGA output test.

Step	Action	Expected Result
22.1	Set the selector switch on the M Series CCT unit to **MONITOR**.	The M Series CCT unit powers on in MONITOR mode.
22.2	Press the **Contrast** button on the M Series front panel.	The M Series CCT unit displays the Contrast menu.
22.3	Press the **Enable VGA Out** softkey. **Note:** If the VGA port is enabled and the unit is off for more than 10 seconds (or the battery is removed), the M Series unit automatically disables the port.	The M Series CCT unit enables the VGA output port, and the softkey label changes to Disable VGA Out.
22.4	Ensure that the external display monitor is OFF. Connect the VGA (DB15) connector from the display monitor to the VGA output port on the M Series CCT unit. Turn the external display monitor ON.	Information generated on the M Series CCT unit is displayed on the external display monitor.
Record your results on the Maintenance Tests Checklist.		

Disassembly Procedures

This section describes the following procedure:

- "Removing the CCT Front Panel" on page 5

Only properly trained technicians should service the M Series CCT unit. Ensure that you take the appropriate safety precautions before disassembling any part of the M Series CCT unit.

Warning!

SHOCK HAZARD!

Take necessary precautions to guard against shock or injury before conducting defibrillator tests or repairs. The M Series CCT unit can contain lethal voltages even when turned off.

In addition:

- Wear a conductive wrist strap that touches your skin and is connected to a grounding mat and to an earth ground when working with static-sensitive units. Remove the wrist strap when you discharge high voltage or when you are working on energized equipment.

Removing the CCT Front Panel

The M Series CCT unit has a specialized front panel that includes a VGA output connector and a larger LCD screen.

This procedure is similar to the procedure for removing the front panel from a standard M Series unit. Refer to the *M Series Service Manual*, "Removing the Front Panel" (Chapter 3: Disassembly Procedures) for more information.

Required tools

You need the following tools to remove the front panel from the M Series CCT unit:

- flat blade screwdriver
- #2 Phillips screwdriver
- orange wood stick

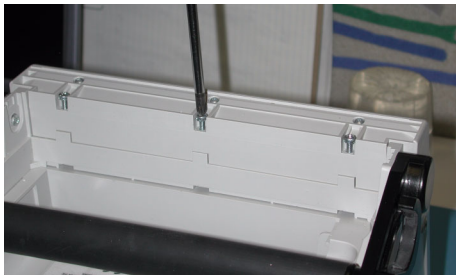
Before you begin

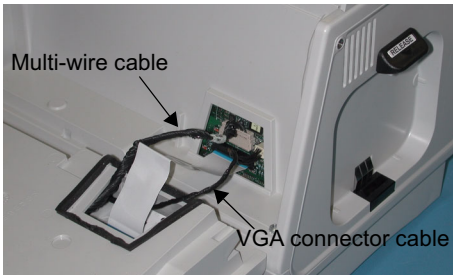
Remove all power sources, such as the battery and power cord.

CAUTION Ensure that you are familiar with the procedure for **removing the ZIF Keeper**; damage to the unit may result if not performed correctly. See the *M Series Service Manual* (Chapter 3: Disassembly Procedures) for more information

Procedure

Follow these steps to remove the front panel from the M Series CCT unit.

Step	Action	
1.	Remove the top cover of the front panel by gently inserting a flat blade screwdriver into the notch at the back. Be careful not to insert the screwdriver too far into the notch, to avoid damaging the front panel.	
2.	Remove the top cover by angling it upwards slightly and gently pulling it away from the front panel.	
3.	Remove the three (3) screws at the top of the front panel.	
4.	Rotate the unit onto its back side so that the bottom is facing you.	
5.	Remove the two screws (closest to the front of the unit) on the bottom of the lower housing module.	

Step	Action	
6.	Rotate the unit back to an upright position. Lift the front panel up and forward to detach it from the M Series CCT unit.	
7.	Disconnect the multi-wire cable and the VGA connector cable from the main system board. Remove the ZIF keeper from the laminated ribbon cable and disconnect the cable. **Note:** Refer to the *M Series Service Manual*, "Removing the ZIF Keeper" (Chapter 3: Disassembly Procedures).	

Reinstalling the CCT front panel

To reinstall the CCT front panel reverse Steps 1 through 7 of the above disassembly procedure.

Note: The M Series CCT front panel will only function with an M Series CCT main assembly. It will not function with an M Series main assembly.

Replacement Parts

You can order replacement parts through an authorized ZOLL distributor or directly from ZOLL Medical Corporation. Pricing information is available from ZOLL Medical Corporation's Technical Service Department.

Note: ZOLL reserves the right to substitute different parts to reflect modifications and improvements in ZOLL M Series circuitry and design.

Ordering replacement parts

When ordering parts, please provide the following information:

- ZOLL M Series device model and serial number
- field-replaceable unit part number
- description of the replacement part

By mail

To order by mail from ZOLL Medical Corporation, address your request to:

ZOLL Medical Corporation
269 Mill Road
Chelmsford, MA 01824-4105

Attention: Technical Service Department

By phone

For more information, contact ZOLL Medical Corporation at 1-978-421-9655 or 1-800-348-9011 (Fax: 1-978-421-0010).

Parts and part numbers

The following table lists the replacement parts available with the CCT option on the M Series unit.

Table 1-1: CCT replacement parts

Description	Part Number
CCT front panel module (with VGA output, pacing, NIBP), English	1011-2019-01
CCT front panel module (with VGA output, pacing only), English	1011-2020-01
CCT front panel module (with VGA output, NIBP only), English	1011-2021-01
CCT front panel module (with VGA output only), English	1011-2022-01
CCT front panel cover	9310-0815
VGA output connector	9301-0355
Video output cable	9500-0314